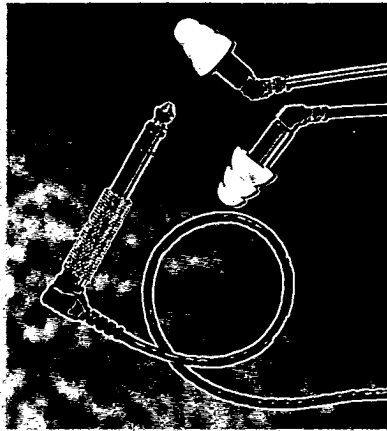


ETYMOTIC'S SOUND-ISOLATING EARPHONE



There's a headphone that takes the traditional approach to low-noise headphone listening—sound isolation—to the extreme. Actually, the ER-4S from Etymotic Research is more appropriately called an earphone: A small cylindrical driver for each ear is partially inserted into a soft-plastic earplug (photo shows a pair with a 1/4-inch phone-plug adaptor for size comparison). Each assembly is in turn carefully inserted fairly deep *into* the ear canal, though it remains a safe distance from the eardrum.

Sound isolation was not why the earphones were developed, however. An outgrowth of Etymotic's work on high-fidelity hearing aids, they were originally designed to be a laboratory standard producing as flat a perceived frequency response as possible. And they do that very well, as can be verified by comparing ear-canal measurements of the sound produced by the ER-4S to that produced in a typical ear canal by a reference "diffuse" sound field.

While other headphone companies use an ear-canal/diffuse-field match as their design ideal, no other phones come as close to realizing it as the Etymotic ER-4S, which is specifically designed to operate in the predictable and controlled sonic environment created by earplugs. The result is sound that's more neutral and uncolored than from any headphones or earphones I've ever used, though a few

very expensive—and hardly portable—electrostatic models have come close.

To achieve that level of sound quality, however, each earplug must be sealed as tightly as possible. Instructions accompanying the ER-4S repeatedly remind the user that "you'll lose bass response" if you don't have a good seal. And both the foreign presence in the ear canals and the practice-makes-perfect insertion procedure take some getting used to. Even with a tight seal, if you're accustomed to typical headphones, which often have deliberately overemphasized lows and many high-frequency faults, you may think that the ER-4S has a rolled-off bass response—until you play a pipe-organ recording with fundamentals below 30 Hz.

When using the ER-4S—and, indeed, any headphone, noise-reducing or not—keep in mind that you'll be partly deaf to sounds of the outside world due to the masking effect of the music. That caution is more important than usual with the ER-4S because of its ability to attenuate external noises by some 20 to 25 dB across the audio band. It's certainly more effective at keeping out high frequencies than some of the sealed-cup and active noise-canceling headphones I've tried.

When the ER-4S is used outdoors, it's quite possible to miss important auditory cues such as approaching emergency vehicles, people talking to you, public-address announcements, and, in New York especially, nearby mayhem of various types. Nonetheless, the small, light, unobtrusive (noise stays out, music stays in), and unobtrusive ER-4S is a nearly ideal subway, train, airplane, or live-recording earphone, albeit at \$330 a rather pricey one. With the extreme noise isolation provided by its earplug-based design and its reference-standard sound quality, the ER-4S is the closest thing yet to a direct sonic connection to the brain. —David Ranada

Etymotic Research, 61 Martin Lane,
Elk Grove Village, IL 60007

Etymotic Research ER-4S Earphones

H P R
LISTENING
TEST

By Bruce Bartlett with Jenny Bartlett

Revealing sound right into your ear canal

These are the finest earphones or headphones I've ever heard. Costing only \$329, the ER-4S earphones compete with electrostatic headphones selling for \$1000 or more.

The ER-4S Canal Phone by Etymotic Research is a set of dynamic earphones which you insert in your ear canals. This placement provides an air-tight seal which keeps out noise and allows superb deep bass.

Design

The earphones in their carrying pouch fit in your shirt pocket. You might say, "Is that all there is for \$300?" But give them a listen; they sound BIG! These tiny units deliver refer-

ence-quality sound that is astonishing.

One reason for this quality is that the Canal Phone's design is based on extensive research into human hearing. To sound natural, earphones and headphones should not have a flat response (as measured at the eardrum). Instead, they need a big emphasis in the upper midrange — a broad 14 dB peak at 3 kHz.

Why is this? When we are listening in a reverberant room, sound approaches us randomly from all directions. That is, we hear a diffuse soundfield. The head, outer ears and ear canals affect the incoming sound by adding a big peak at around 3 kHz. Since earphones bypass

the head and outer ears, this 3 kHz peak is missing. It therefore needs to be restored by tailoring the response of the earphones.

Etymotic claims that its earphones have the most accurate match to the ear's diffuse-field response. Another model, ER-4B, closely matches the diffuse curve. It's meant for listening to binaural recordings made with a dummy head placed in the audience area. Model ER-4S, however, has slightly reduced highs, and it sounds more natural when listening to the usual close-miked recordings of classical and popular music. The ER-4S sounds best with most recordings.

Each black plastic earphone is the size of a cigarette filter. A red flex relief denotes the right channel; blue denotes left. The 'phones have a thin four-foot cable, gold-plated mini earphone plug and gold-plated 1/4" 'phone plug adapter. Two types of ear seal are provided: compressible foam or triple flanges made of soft silicone rubber. Extra ear seals are included. If your ear canals are unusual in size or shape, the tips might be uncomfortable or have a poor seal. For best fit, you can order custom-fitted ear

molds from the company. A shirt clip and a foam-lined case complete the package.

Since ear wax can clog the filters built into the earphone tips, Etymotic suggests that you clean your ears before use. (I put cotton swabs in the carrying case for this purpose.) If the filters get clogged, you can replace them with the spare filters provided. The inner end of each ear seal is about 1/4" from your eardrum when fully inserted.

Etymotic rates the frequency response as 20 Hz to 16 kHz. Sensitivity is 98 dB SPL per mW, while maximum output is 114 dB SPL. Impedance is rated at 100 ohms. The 'phones weigh only 1 ounce. As for polarity, + voltage makes + acoustic pressure.

Comfort

To me, the Canal Phones are more comfortable than most headphones because there is no

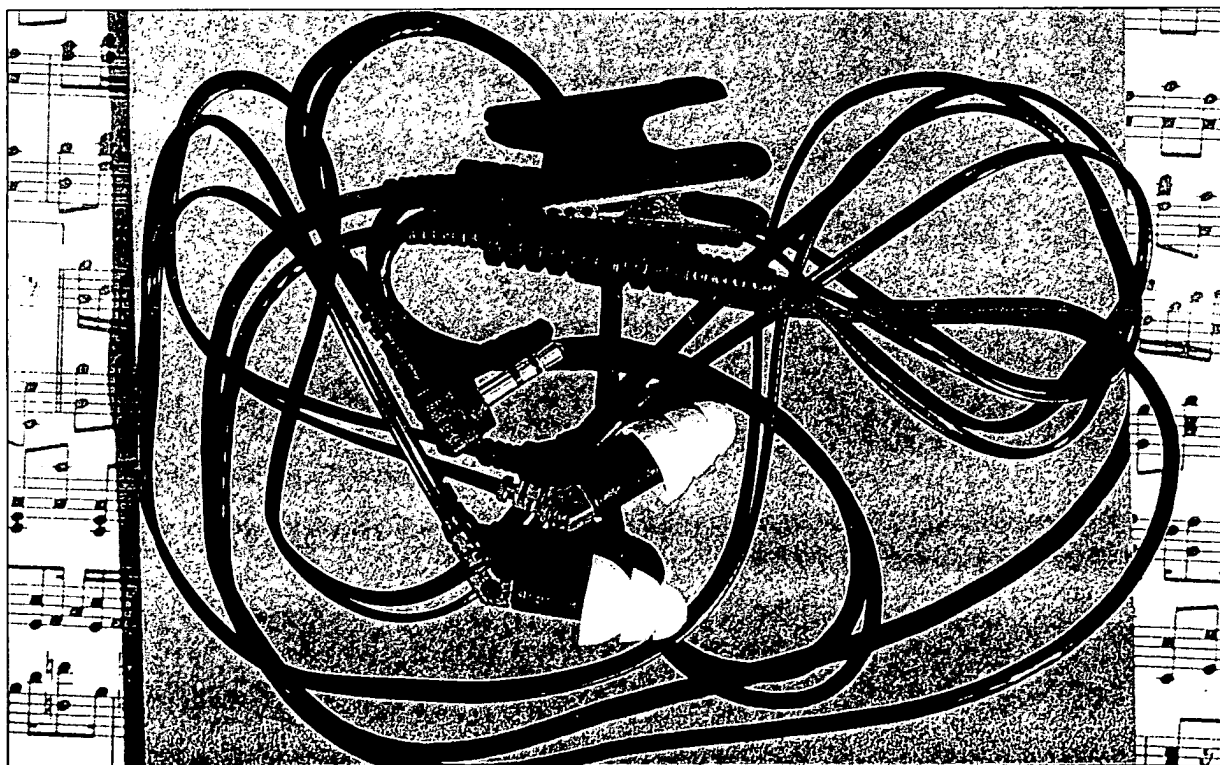
pressure on the outer ears. Some users, however, might not like the sealed-off effect. It's like wearing earplugs. In fact, the isolation from outside sounds is excellent (24 dB or more). When you wear the Canal Phones, you're in a musical world of your own. They're great for lis-



tening in noisy environments or for monitoring a recording when you are in the same room as the musical ensemble.

According to Etymotic Research, quiet musical sounds on recordings are masked by the ambient noise level in homes (typically 43 dBA). This noise prevents you from hearing the softest sounds unless you turn up the volume to unnatural levels. But when you wear the Canal Phones, you can hear the full dynamic range without excessive volume.

When I first listened to the ER-4S with the soft-flange ear seal, I was disappointed by the weak bass and sizzly highs. The company cautions that if the earphone is not tightly sealed to the ear canal, the bass response will be reduced. I switched to the ear seals made of foam, which accommodate larger ear canals and conform better to their shape. I rolled them tightly between my fingers, put them in my ears, and let the foam expand to form a perfect seal. Then I heard plenty of deep bass.



What Sound!

With a good seal, the lows really plumb the depths. There's a sense of power and weight seldom heard in headphones. Yet the bass is wonderfully tight and free of coloration. You'll hear absolutely no boominess or bumped-up bass as you often do with other headphones.

Similarly, the rest of the audio range sounds accurate and neutral. Cymbals are every bit as crisp and airy as the real thing. In fact, I thought the upper highs were a little too strong until I heard real cymbals at a concert of acoustic jazz the day after auditioning the ER-4S. These earphones play all the highs that are in the recording. If the sound is too bright, you can always nudge down the treble on your preamp.

The transient response, clarity and detail of the ER-4S are phenomenal. Due to the low moving mass of the earphones' diaphragm, it tracks the incoming signal accurately. Quite simply, these are the most transparent, revealing 'phones I've had the pleasure to hear.

The ER-4S tonal balance reminds me of Sony MDR-V6 headphones (now called MDR-7506), but with less bass, more extended highs and a smoother response. It's as if the ER-4S started with the response of the MDR-V6, then refined it by an order of magnitude.

The Etymotic ER-4S earphones provide an entry into the high end of audio for only a few hundred dollars. If you crave reference-quality sound with comfort and noise exclusion, the ER-4S earphones will give it to you. Highly recommended.

They have a 1-year warranty and 30-day return privilege.

Etymotic Research is at 61 Mar-

tin Lane, Elk Grove Village, IL 60007; phone (708) 228-0006. Two dealers are: (1) RDL Acoustics, 26 Pearl Street, No. 15, Bellingham, MA 02019; phone (800) 227-0390; and (2) Headroom Corp., Perfect Portables Div., P.O. Box 6549, Bozeman, MT 59715; phone (800) 828-8184. □

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